

# New Developments in Greenhouse Gas Measurements and Earth Observation for Climate

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# What do we cover?



## Greenhouse gas measurements

Support tax, trade and regulatory instruments for carbon pricing, reporting and management



## Climate data

Provide confidence and reduce uncertainties in climate data used for monitoring and modelling



## Low carbon technologies

Accelerate development and assess performance of low carbon technologies



**Greenhouse gas measurements**

# New facility #1: New DIAL

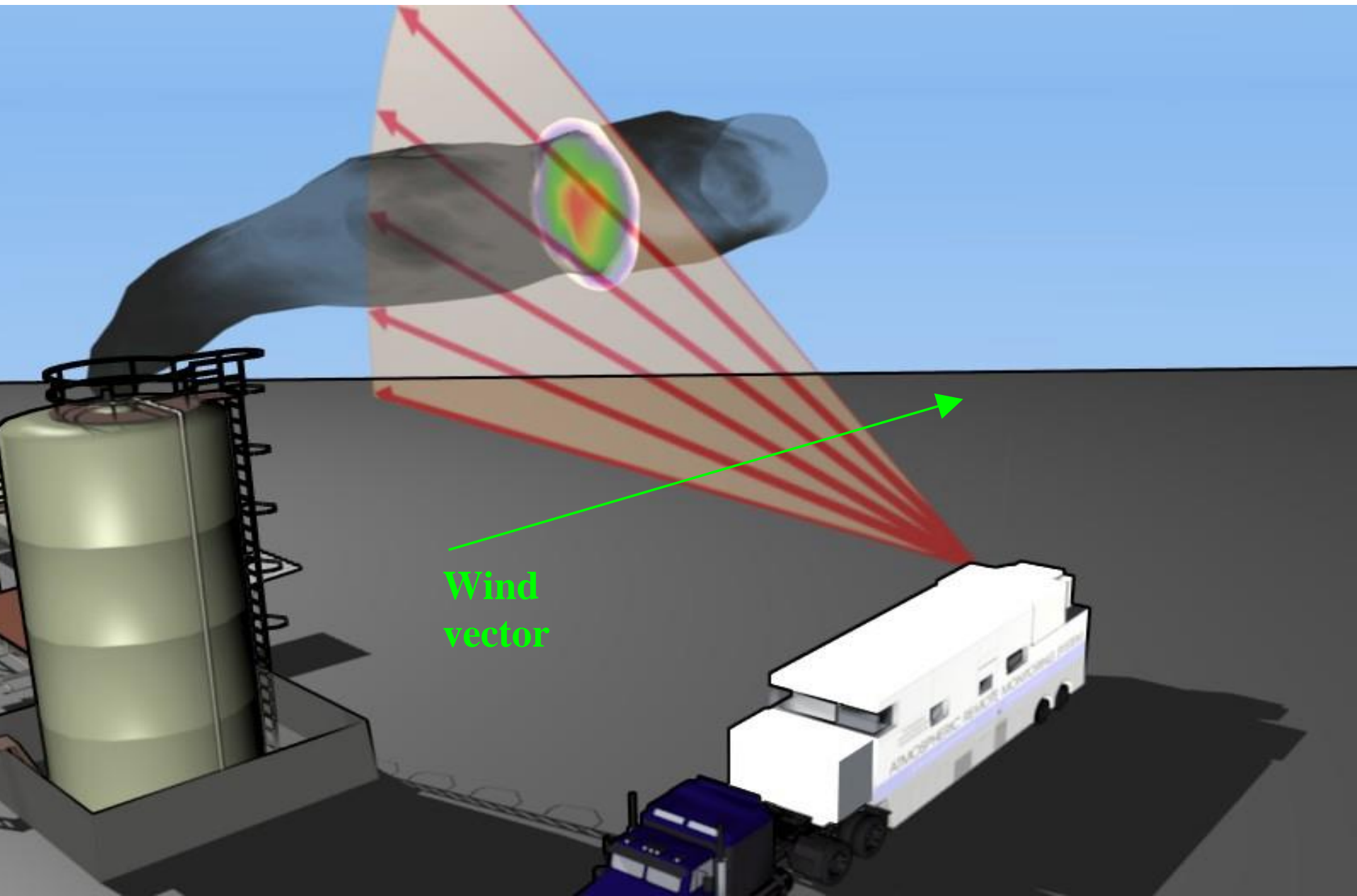


- Greater detection sensitivities that offer more accurate results
- Flexible system that enables operators to switch between the types of pollutants being measured
- More efficient data manipulation and usage e.g. improved software

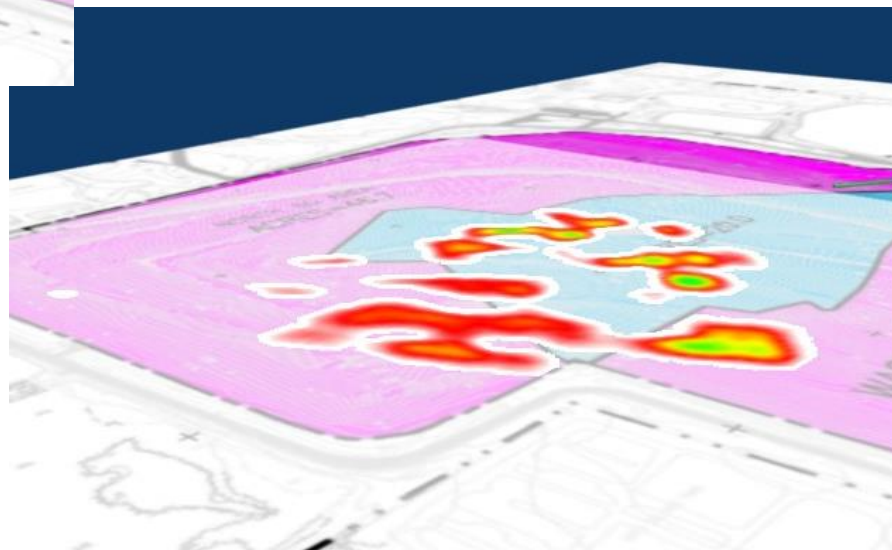
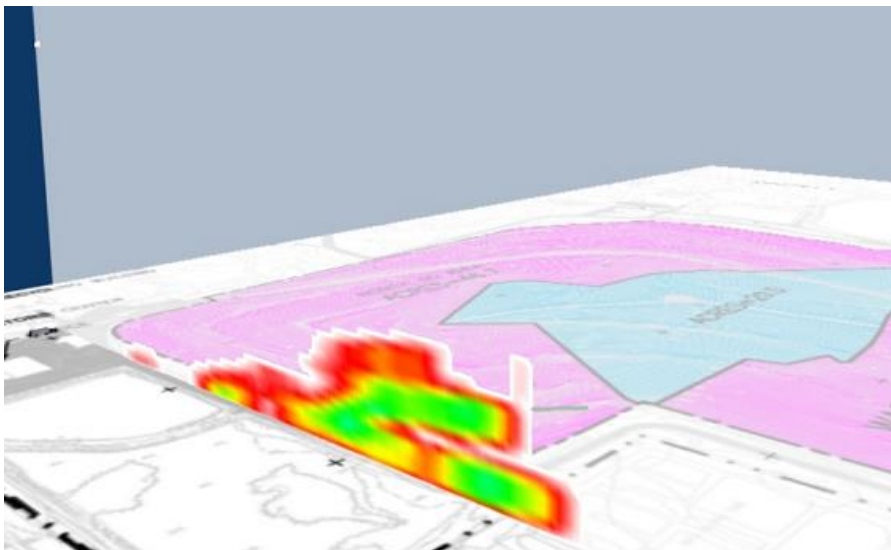
# Increase in focus on fugitive emissions internationally

- Health and safety
- Avoid economic loss e.g. in the case of natural gas
- Global warming potential of some gases much larger than that of carbon dioxide
- Reporting:
  - Companies reporting under permit/licence
  - National inventories
  - GHG reduction targets under UNFCCC
- Concerns in particular sectors e.g. shale gas





# Example DIAL results



# New facility #2: Area source facility





# What are area source emissions?



# Why are we interested?

- Evidence-based determination of emission factors
- Reduce uncertainties and increase confidence in reported emission values
- Develop improved remote sensing techniques and monitoring protocols
- Test new sensors

# Comparison of Remote Monitoring Equipment



# Area Source Emissions Facility

- A novel facility for the performance testing and calibration of current remote monitoring systems, and validation of new technologies, measuring GHGs (primarily  $\text{CO}_2$ ,  $\text{CH}_4$ ,  $\text{C}_3\text{H}_8$ ).
- The system is capable of producing both uniform and a variety of non-uniform emission type plume characteristics as found at landfill sites, CCS plants, in industry or agriculture.
- Have a top emission rate capability on order of  $50 \text{ kg}\cdot\text{hr}^{-1}$ , comparable to the emission rates of small-medium industrial fugitive releases.
- Incorporate some capability to introduce cross interfering species to the emitted gas matrix.
- The facility is transportable.

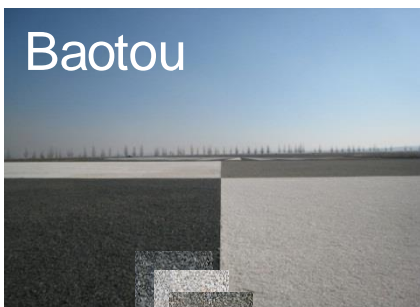
# Earth Observation for Climate





# Vicarious Post-Launch Calibration

- RADCALNET
- Ensure radiometric integrity of space-borne instruments
- Spatially uniform, bright, large targets (pixels from 10 to 100s m)
- Flat, “No Atmosphere” i.e. low cloud levels
- Standardised procedures to aid characterisation
- Comparisons of field instruments & techniques to ensure consistency and traceability

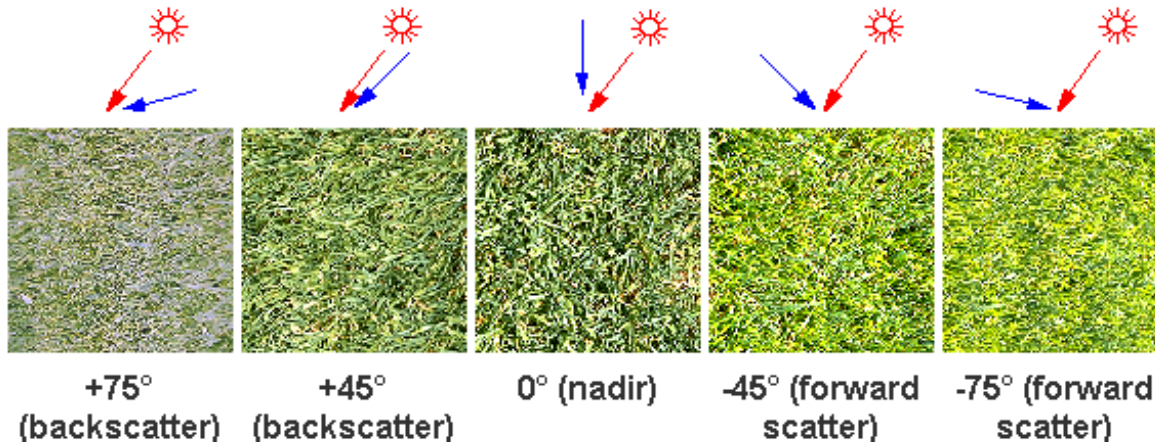


# Even easy test sites have challenges

## Gonio-Radiometric Absolute Spectrometer System (**GRASS**)



- Extremes of temperature
- Representative-ness over large areas in short time scales
- Atmospheric effects
- Animals...

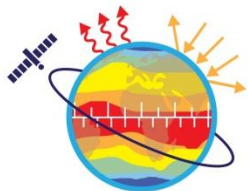


# NPL Training Course

## Uncertainty for Earth Observation Training Course

Textbook, presentations and future course information can be found here:

<http://www.meteoc.org/training.html>



Metrology for Earth  
Observation and Climate

**Thank you for listening.  
Any questions?**

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